

# CLAIMS

1. Work device (1) comprising:

- a work box (Bo) provided with means (o, s)  
5 for introducing a liquid of interest (E) into the box  
and for extracting the liquid of interest from the box,
- a substrate (S) comprising an active  
surface that is substantially non-wetting for said  
liquid of interest contained in said box,
- 10 - a plurality of distinct work zones (Zt)  
formed on said active surface and each surrounded by a  
border (b) formed on said active surface that is  
substantially non-wetting for the liquid of interest,  
the borders not touching one another and having no  
15 common edge,

in which the means (o, s) for introducing and  
extracting the liquid of interest respectively into and  
from the box are arranged on said work box in such a  
way that when the liquid of interest is introduced into  
20 the box (Bo), it covers the work zones and their  
respective border, and

in which the borders have a geometry such that  
when the liquid of interest is extracted from the box,  
after having been introduced therein, a drop (g) of the  
25 liquid of interest (E) remains imprisoned by each  
border (b) and in contact with the work zone (Zt) that  
it surrounds.

2. Device according to Claim 1, in which the,  
30 at least one, work zone is in the same plane as the  
active surface.

3. Device according to either of Claims 1 and 2, in which the, at least one, work zone is a zone of electrical and/or chemical interaction with the drop captured by its border.

4. Device according to Claim 3, in which the, at least one, work zone is an electrochemical microcell.

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5. Device according to Claim 1, in which the, at least one, work zone is a sensor selected from the group consisting of an optical, electrical, magnetic, electrostatic, mechanical, thermal or chemical sensor.

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6. Device according to Claim 1, in which the, at least one, work zone is an actuator selected from the group consisting of an optical, electrical, magnetic, electrostatic, mechanical, thermal or chemical actuator.

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7. Device according to any one of Claims 1 to 4, in which the, at least one, work zone is a zone for detecting at least one chemical or biological species that may be present in the drop of liquid of interest when it is captured.

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8. Device according to Claim 7, in which the, at least one, work zone is a zone functionalized by a probe for interacting with a target that may be present in the drop of liquid of interest when it is captured.

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9. Device according to Claim 8, in which the probe is selected from the group consisting of an enzyme, an enzyme substrate, an oligonucleotide, an oligonucleoside, a protein, a membrane receptor of a eukaryotic or prokaryotic cell, an antibody, an antigen, a hormone, a metabolite of a living organism, a toxin of a living organism, a polynucleotide, a polynucleoside and a complementary DNA.

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10. Device according to Claim 1, in which the, at least one, work zone is a zone that is non-wetting for the liquid of interest.

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11. Device according to Claim 1, in which the substrate consists of a material selected from the group consisting of silicon, silicon dioxide, silicon nitride, glass, an organic polymer, plastic, tin, and a metal.

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12. Device according to Claim 11, in which the organic polymer is selected from the group comprising polycarbonates, polydimethylsiloxanes, polymethyl methacrylates, polychlorobiphenyls and cycloolefin copolymers.

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13. Device according to Claim 11, in which the metal is selected from the group consisting of Au, Ti, Pt, Al, Ni, and the metal alloy is stainless steel.

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14. Device according to Claim 1, in which the borders have a shape around the work zone and viewed from above, that is selected from an annular, a star, a rectangle, a square, a triangular, an elliptical shape,  
5 or a polygon having 4 to 20 sides.

15. Device according to Claim 1, in which the borders have a cross section, in the direction from the active surface to the upper part of the border,  
10 selected from a triangular, rectangular, conical, frustoconical, semi circular or semi-elliptical shape.

16. Work device according to Claim 1, in which the borders are wetting for the liquid of interest on  
15 their uppermost part with respect to the active surface and/or on their slope opposite the work zone that it surrounds.

17. Device according to Claim 1, in which the  
20 borders are obtained by stamping or moulding of the active surface.

18. Work device according to any one of the preceding claims, in which the means for introducing  
25 the liquid of interest into the box comprise a pump for injecting the liquid of interest into the box.

19. Work device according to any one of the preceding claims, in which the means for extracting the  
30 liquid of interest from the box comprise a pump for extracting the liquid of interest from the box.

20. Device according to Claim 19, in which the pump for extracting the liquid of interest from the box is in the form of a pump for injecting a gaseous fluid into the box, via a first opening formed in the box, so as to be able to inject into the box a gaseous fluid expelling the liquid of interest from the box via a second opening formed in the box.

21. Device according to Claim 20, in which the gaseous fluid injection pump comprises a device for saturating the gaseous fluid injected with vapour of the liquid of interest.

22. Device according to Claim 19, in which the pump for extracting the liquid of interest from the box is in the form of a suction pump arranged at one opening formed in the box so as to be able to extract the liquid of interest from the box by sucking it out via this opening.

23. System comprising a device according to any one of Claims 1 to 22.

24. Biological chip comprising a device according to any one of Claims 1 to 22.

25. Biological chip according to Claim 24, said chip being selected from the group consisting of nucleic acid chips, antibody chips, antigen chips, protein chips and cell chips.

26. Method for producing a device according to Claim 1, said method comprising the following steps:

- supplying a substrate,
- 5       - forming work zones on said substrate,
- structuring the substrate surface so as to form a border around the work zones,
- treating the surface on which the work zones and their border have been formed so as to make it
- 10       substantially non-wetting for the liquid of interest,
- supplying a box and introducing therein the substrate comprising the work zones surrounded by their border, said box comprising means for introducing the liquid of interest into the box and means for
- 15       extracting the liquid of interest from the box, and
- closing said box.

27. Production method according to Claim 26, in which the borders are formed on the active surface by

20       direct etching of said active surface.

28. Production method according to Claim 26, in which the borders are formed on the active surface by deposition of a material on said active surface

25       followed by etching or photolithography of said material.

29. Production method according to Claim 28, in which the material deposited is selected from the group

30       consisting of a resin, a photoresist, organic polymers, metals, Si, oxidized Si, and Si nitride.

30. Production method according to either of  
Claims 28 and 29, in which the deposition of a material  
on said active surface to form the borders is carried  
5 out using a method selected from coating, evaporation,  
spraying and electroplating.

31. Production method according to either of  
Claims 28 and 29, in which, the material being  
10 photosensitive, the borders are made by  
photolithography.

32. Production method according to Claim 26, in  
which the borders are obtained by stamping or moulding  
15 of the active surface.